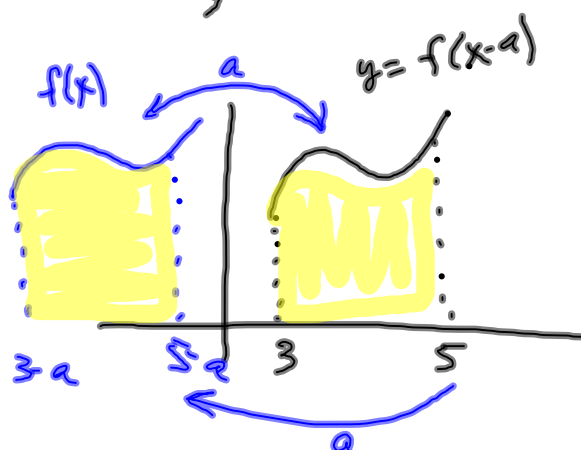


75. $F(5-a) - F(3-a)$

$$\int_3^5 f(x-a) dx$$

$F(5-a) - F(3-a)$

$$\int_{3-a}^{5-a} f(x) dx$$


$\frac{d}{dx} F(x) = \frac{d}{dx} \int_k^x f(t) dt$

$\frac{d}{dx} G(x) = \frac{d}{dx} \int_{k-a}^{x+a} f(t-a) dt$

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25 $\int \frac{dx}{(1-x)^2}$ $u = 1-x$
 $du = -dx$

$$\int \frac{-du}{u^2} = - \int \frac{1}{u^2} du = - \int u^{-2} du$$

$$- \frac{u^{-1}}{-1} = \frac{1}{u} = \frac{1}{1-x} + C$$

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$$53 \quad \int_0^3 \sqrt{y+1} \, dy \quad \int_1^4 \sqrt{u} \, du$$

$$u = y+1$$

$$du = dy$$

$$y=0 \quad u=1$$

$$y=3 \quad u=4$$

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$$79 \quad \int 2 \sin x \cos x \, dx$$

$$u = \sin x$$

$$u = \cos x$$

$$\sin^2 x + C_1$$

$$-\cos^2 x + C_2$$

$$1 - \cos^2 x + C_1$$

$$-\cos^2 x + C_1 + 1$$

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6.3 Integration by parts

sometimes used to integrate a product

also used to evaluate $\int \ln x \, dx$, $\int \tan^{-1} x \, dx$

$$\int u \, dv = uv - \int v \, du \quad \text{easier}$$

ex $\int x \cos x \, dx = x \sin x - \int \sin x \, dx$

let $u = x$ $\cos x \, dx = dv$
 $du = dx$ $v = \sin x$

$$y = x \sin x - (-\cos x) + c$$

$$= x \sin x + \cos x + c$$

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$$\int x^2 e^x \, dx = x^2 e^x - 2 \int e^x x \, dx$$

$u = x^2$ $dv = e^x \, dx$ $du = 2x \, dx$ $v = e^x$

do it again \uparrow $u = x$ $e^x \, dx = dv$
 $du = dx$ $v = e^x$

$$= x^2 e^x - 2 \left(x e^x - \int e^x \, dx \right)$$

$$= x^2 e^x - 2x e^x + 2e^x + c$$

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$u =$ log inverse trig
 poly exp trig

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$$\int x \ln x \, dx = \frac{x^2}{2} \ln x - \int \frac{x^2}{2} \cdot \frac{1}{x} \, dx$$

$$u = \ln x \quad dv = x \, dx$$

$$du = \frac{1}{x} \, dx \quad v = \frac{x^2}{2}$$

$$= \frac{x^2}{2} \ln x - \frac{1}{2} \int x \, dx$$

$$= \frac{x^2}{2} \ln x - \frac{1}{2} \frac{x^2}{2} + C$$

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$\int x^2 e^x dx = x^2 e^x - 2x e^x + 2e^x + c$

poly $e^x, \sin x, \cos x$
 take der x^2 + e^x take antider
 $2x$ - e^x
 2 + e^x
 0 e^x
 poly

fabular integration

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$\int x^3 \sin x dx = -x^3 \cos x + 3x^2 \sin x + 6x \cos x - 6 \sin x + c$

x^3 $\sin x$
 $3x^2$ - $\cos x$
 $6x$ + $-\sin x$
 6 - $\cos x$
 0 $\sin x$

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Ex 4

$$\int e^x \cos x dx = e^x \sin x - \int e^x \sin x dx$$

$$\begin{array}{l|l} u = e^x & dv = \cos x dx \\ du = e^x dx & v = \sin x \end{array} \quad \begin{array}{l} u = e^x & dv = \sin x dx \\ du = e^x dx & v = -\cos x \end{array}$$

$$\int e^x \cos x dx = e^x \sin x - \left(-e^x \cos x + \int e^x \cos x dx \right)$$

$$\int e^x \cos x dx = \frac{e^x \sin x + e^x \cos x}{2} - \int e^x \cos x dx$$

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Ex 7

$$\int \ln x dx = x \ln x - \int x \frac{1}{x} dx$$

$$u = \ln x \quad dv = dx$$

$$du = \frac{1}{x} dx \quad v = x$$

$$= x \ln x - \int dx$$

$$= x \ln x - x + C$$

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